Mood instability, mental illness and suicidal ideas

Results from a household survey

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Abstract

Purpose: There is weak and inconsistent evidence that mood instability (MI) is associated with depression, PTSD and suicidality although the basis of this is unclear. Our objectives were first to test whether there is an association between depression and PTSD, and MI and secondly whether MI exerts an independent effect on suicidal thinking over and above that explained by common mental disorders. Methods: We used data from the Adult Psychiatric Morbidity Survey 2007 (N=7131). Chi-square tests were used to examine associations between depression and PTSD, and MI, followed by regression modelling to examine associations between MI and depression, and with PTSD. Multiple logistic regression analyses were used to assess the independent effect of MI on suicidal thinking, after adjustment for demographic factors and the effects of common mental disorder diagnoses. Results: There are high rates of MI in depression and PTSD and the presence of MI increases the odds of depression by 10.66 (95% CI 7.51-15.13) and PTSD by 8.69 (95% CI 5.90-12.79) respectively, after adjusting for other factors. Mood instability independently explained suicidal thinking, multiplying the odds by nearly five (OR 4.82; 95% CI 3.39-6.85), and was individually by some way the most important single factor in explaining suicidal thoughts. Conclusions: MI is strongly associated with depression and PTSD. In people with common mental disorders MI is clinically significant as it acts as an additional factor exacerbating the risk of suicidal thinking. It is important to enquire about MI as part of clinical assessment and treatment studies are required.

Key words: Mood instability, suicidal ideas, risk, depression, PTSD

Introduction

Affective experience tends to differ for individuals along several dimensions including in its level of stability and the extent to which people recognise and respond to their experience [1]. Mood instability is an understudied aspect. Despite the lack of a clear and well validated definition, a clinical description of mood instability is provided by the 4th edition of the Diagnostic and Statistical Manual [2] which highlights mood instability as due to a "marked reactivity of mood" (p707) and as a Borderline Personality Disorder criterion. This definition implies mood lability. Trull et al [3], based on momentary assessments of depression suggest an alternative definition of "extreme and frequent fluctuations of mood over time".

Mood instability may be a state or trait dependent factor. Given its common appearance in factor analyses of self-report measures of temperament, mood instability has been understood within the framework of personality research and especially in the context of Eysenck's Big Three model [4]. Neuroticism a core component of many personality models can be defined as a propensity to negative emotional states and has been strongly associated with mood instability [5]. Underlying connections between neuroticism, extraversion and psychoticism and mood instability are yet to be completely resolved [6] but mood instability does appear to be persistent over time [7] suggesting it is a stable temperamental style.

Whilst much literature supports the notion that mood instability is linked to personality factors, this does not appear to be the whole story. McConville and Cooper [6] found psychoticism and neuroticism was associated with mood instability in a small sample of students. However psychoticism and neuroticism taken together with other personality factors did not explain the majority of statistical variance in mood instability. Also Miller and Pilkonis [8] examined the inter-correlations of neuroticism and mood instability with a range

of outcomes and concluded that both types of psychopathology represented distinct constructs. Mood instability is also apparent in people who abuse alcohol without a dual diagnosis, even after detoxification [9]. There is potential for diagnostic confusion given that persistent and significant mood instability in patients may be clinically mislabelled as an abnormal personality trait, whilst actually representing chronic manic or hypomanic symptoms [10]. These difficulties of the nosology of mood instability are widely described in the bipolar disorder and borderline personality disorder literature also [11].

It is widely assumed that mood instability is seen alongside Axis I disorders such as depression and Post Traumatic Stress Disorder (PTSD) [12], but epidemiological evidence that this is the case is scarce. Mood instability as derived through a clinical interview was significantly associated with a lifetime and current history of depression in a large (N=288) community sample [13]. However Golier and colleagues [14], report compared to those without psychiatric disorder, people with depression have lower levels of mood instability corroborating the findings of previous work [15].

Episodes of significant arousal in Post Traumatic Stress Disorder (PTSD), to some extent overlap with the construct of mood instability, although evidence of an association is again limited. In a small sample of veterans those with PTSD had higher levels of mood instability (measured as negative mood states) than those without PTSD [16]. Mood instability even over a 24 hour period appeared to be more prevalent in those with PTSD than non-psychiatric controls [14].

The study of mood instability is important not only on a theoretical basis to expand understanding of psychopathology but also because it has the potential to affect functioning.

Previous evidence sampling Gulf War veterans suggests an increasing number of borderline personality traits are associated with poorer quality of life, greater functional impairment and healthcare use [17]. Also mood instability and self-harm predicted poorer academic performance and social adjustment in young adults [18] even after controlling for axis I and II psychopathology. The clinical importance of mood instability is further emphasized by its correlation to suicidality within a range of psychiatric disorders. For example in depression, mood instability appears to be associated with a greater likelihood of self-reported suicidal thinking and action, although whether the instability actually represents bipolarity is unclear [19].

One difficulty with the literature to date is that it assumes that the effects of mood instability on suicidality may be confounded by the possible association with the mental illness. However given that mood instability may be a distinct psychopathological construct it is possible that its influence is independent to the effect of the mental disorder or even more important than it in explaining suicidality.

Thus both the experimental [20] and the clinical literature suggest that examining mood instability as a unitary factor may be useful and clinically relevant. In summary there is very little previous literature on the extent to which mood instability is an important factor in people with psychiatric diagnoses. The evidence that is available largely centres on the association between mood instability and depression and PTSD but is inconclusive. Whilst previous evidence suggests mood instability is linked to suicidality, the basis of this association is unclear. We therefore use data from a household survey to answer two questions with regards to mood instability:

Question one: Is there an association between mood instability and depression, and post-traumatic stress disorder, after adjusting for other factors

Question two: Does mood instability exert an independent effect on suicidal thinking over and above that explained by common mental disorders, and if so what is the size of the effect?

Method

This analysis uses data from the Adult Psychiatric Morbidity Survey (APMS) 2007, a household survey designed to be representative of adults living in private households in England (UK). A detailed description of the survey and the sampling methods employed is provided in the main survey reports [21,22]. The Royal Free Hospital and Medical School Research Ethics Committee gave ethical approval for the survey.

Sampling

A multi-stage stratified probability sampling design was adopted for the survey with the small user Postcode Address File (PAF) being the sampling frame. The PAFs are postal addresses for delivery points which receive less than 50 items of mail each day. One adult aged 16 years or over was selected for interview in each household. There was no upper age limit for participants. Structured assessments and screening instruments for mental disorders were applied using interviews lasting approximately 90 minutes. These were either face to face interviews or a Computer Assisted Self Interview (CASI).

Measures

In this analysis an item from the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II) [23] was used as the measure of mood instability. The item

asks *"Do you have a lot of sudden mood changes?"* with the timescale for this symptom being *"suffered this over the last several years"*. This item in the SCID-II is designed to elicit the mood instability component of the DSM-IV Borderline Personality Disorder (BPD) criteria. Respondents can answer *yes* or *no* with no indication of sub-threshold symptoms unlike the full clinical interview. Respondents were asked about suicidal thoughts. These were strictly defined as having had "thoughts of taking your own life" over the last year [21].

The presence of non-psychotic symptoms associated with the common mental disorders (depressive episodes, anxiety disorders, phobic disorders, etc.) according to the ICD-10 were assessed using the Clinical Interview Schedule- Revised (CIS-R) [24]. This is an interviewer administered questionnaire addressing non-psychotic symptoms in the past week which can be used to derive ICD-10 diagnoses. The extent of alcohol misuse was measured using the Alcohol Use Disorders Identification Test (AUDIT) [25]. Hazardous drinking is indicated by an AUDIT score of 8 or more and harmful drinking by a score of more than 16.

Symptoms of PTSD occurring in the last week were collected using the Trauma Screening Questionnaire (TSQ) [26]. The questions in the TSQ cover the arousal and re-experiencing items as listed in the Posttraumatic Stress Symptom Scale – Self-Report [27], which match the DSM-IV criteria for PTSD. Arousal and re-experiencing symptoms are criterion which best predict the PTSD diagnosis [28]. Validation studies have been completed and the TSQ has been used as a screen for PTSD in a number of other epidemiological surveys [29]. There are ten questions that ask if respondents have experienced relevant symptoms at least twice in the last week. Confirming six or more of these symptoms indicated a positive screen. In the current analysis a positive screen was used as the indication for PTSD variable as opposed to a definite diagnosis of PTSD, which would have required a structured clinical interview.

Data Analysis

In order to account for non-response the survey data were weighted so that the results were representative of the population living in private households and aged over 16 years. Weighting took account of the probabilities of respondents coming from households of a different size and household non response bias. Then calibration weighting was used based on age, sex and region in order to ensure representativeness. All analyses of statistical significance in the current investigation were based on weighted data.

The first stage of the analysis investigated univariate associations between the ICD-10 diagnoses (based on CIS-R) of depression (any severity) and PTSD, and mood instability using Chi-square tests of weighted data. Tests were considered significant if p-values were less than 0.05 (5% level). Regression modelling was then used to examine the association between mood instability and depression and mood instability and PTSD, adjusting for socio-demographic factors and alcohol and substance misuse.

Multiple logistic regression analyses were used to assess the independent effect of *mood instability* on *suicidal thinking*, after adjustment for a range of important demographic factors (e.g. age, gender etc.) and the effects of common mental disorder diagnoses. Modelling proceeded by initially including all demographic factors, which were age (in 10 year bands), gender, ethnic group (white, black, south asian and other), employment status (employed, unemployed and economically inactive), marital status (married, cohabiting, single, widowed, divorced and separated), alcohol use (AUDIT scores in range 0-7, 8-15 and 16-40) and drug use in the last year (yes or no). S*uicidal thinking* (coded dichotomously as yes or no) was the response variable in the logistic regression model.

Indications for six common mental disorders as defined by the ICD-10 (Agoraphobia, Panic Disorder, Obsessive-Compulsive Disorder (OCD), Generalized Anxiety Disorder (GAD), Social Phobia and Depression) and PTSD positive screen were then each added to the demographic model and the effects of each indication assessed independently, prior to the inclusion of all indications together with *mood instability*. A stepwise algorithm, using the Bayesian information criterion (BIC) for model selection, was used to find the most parsimonious model including the basic demographic data but allowing dropping of any or all of the common mental disorders and *mood instability*. This allowed us to test if any or all of the identified mental disorders and/or *mood instability* were predictive of suicidal ideas, after adjusting for patient demographics.

Deletion diagnostics allowed assessment of the importance of each variable in the final model using likelihood ratio tests and overall model fit was quantified using Nagelkerke's R^2 statistic. Significance was assessed at the 5% level, with 95% robust confidence intervals constructed using estimated log odds ratios and robust standard errors based on asymptotic normality. Analysis was undertaken in the statistical software R.

The Adult Psychiatric Morbidity Survey 2007 contains data records for 7403 individuals. However, for the modelling described here it was necessary to restrict ourselves to complete cases only, giving 7131 data records (96.3%). Although this was considered to be a very small amount of missing data, multiple imputation was also undertaken using the chained equation methodology (`mice` package in R) and parameter estimates from this analysis compared to the complete case analysis. As expected, there was little difference in estimates between analyses, so for simplicity the complete case analysis only is discussed here.

Results

Overall 7403 people were interviewed in phase 1 with a response rate of 57% of those eligible to participate in the study. Detailed characteristics of the sample are provided in the APMS main report [21]. In summary of the sample 43.2% were men, 56.8% women, 92.6% white, 2.6% Black , 2.7% south Asian and 2.2% mixed / other. In terms of marital status the proportions were: married or cohabiting (55.8%), single (19.3%), widowed (12.8%) and divorced / separated (12.1%). Age range in 20 year bands was: 16-34yrs (21.7%), 35-54yrs (34.4%), 55-74yrs (31.2%), over 75yrs (12.8%). In total 1018 out of 7329 people in the sample reported mood instability giving a prevalence of 13.9% [30] and of these 63.9% did not have any of the common mental disorders used for model development.

Association of mood instability with depression, and with PTSD

In men who had depression (any severity) or were PTSD screen positive the rates of mood instability were 68.5% and 69.5%. In women the equivalent figures for depression and PTSD were 62.1% and 60.5%. The first stage univariate analysis showed that *mood instability* was strongly associated with both post-traumatic stress disorder (χ^2 statistic X^2=430.7, p-value < 0.01) and depression (X^2=441.5, p-value < 0.01). Regression analyses showed that mood instability was very strongly associated with a diagnosis of depression (estimated odds ratio (OR) 10.66; 95% CI 7.51-15.13) and PTSD (OR 8.69; 95% CI 5.90-12.79) after other factors had been adjusted for.

Mood instability and suicidality

Model selection, for the full logistic regression including all six common mental disorders, showed that being PTSD screen positive, having a diagnosis of OCD, GAD, and depression and *mood instability* were all strongly associated with suicidal ideas. Table 1 shows changes

in model deviance, compared to the full model, after dropping each of the terms from the full model. Likelihood ratio tests indicated that mental disorders and *mood instability* were individually more strongly associated with suicidal ideas than any of the demographic factors, and a ranking by the deviance change for each term indicated that mood instability was by some way the most important term in the fitted model. The full model accounted for 33.14% of the variability in the response (R^2). This was reduced to 28.64% with the dropping of *mood instability* from the full model, whereas the dropping of PTSD, OCD, GAD and depression collectively reduced the R^2 value to 23.33%; the demographic data alone accounted for just 11.85%.

Table 1 about here

Estimated odds ratios (ORs) from the full model are shown in Table 2, and are such that a value of the OR larger than one indicated an increased risk of suicidal thoughts within the last year. PTSD screen positivity and a diagnosis of OCD, GAD and depression significantly increased the odds of having experienced suicidal thoughts in the last year. Estimated odds ratios were between three and seven, and lower limits of the 95% confidence intervals were greater than one. Mood instability multiplied the odds by nearly five (OR 4.82; 95% CI 3.39-6.85), and was individually by some way the most important single factor in explaining suicidal thoughts.

Table 2 about here

Discussion

The first main finding of this analysis was that mood instability was strongly and independently associated with PTSD and a diagnosis of depression increasing the odds of

these by a factor of 8.69 and 10.66 respectively. This finding confirms what is widely assumed but for which there is no previous epidemiological evidence; that is mood instability co-segregates with these mental disorders. Previous evidence examining the effects of anti-depressant treatment indicated mood instability and depression can co-occur [31] and our findings replicate and extend this work using a large dataset.

There are a range of explanations for why mood instability might be associated with these disorders. One possibility is that mood instability is a vulnerability factor. In the current analysis mood instability was coded from a personality trait assessment and therefore having this temperamental trait may mean that individuals are more likely to develop depression and PTSD. The potential pathway may be through the strong association between mood instability and neuroticism which itself is a risk factor for depression [32,33].

An alternative possibility is that mood instability may mean people are more likely to have stressful life events, such as interpersonal difficulties with partners and these could trigger depression [13,8]. Also mood instability causes considerable emotional distress [34] and this may lead to depression, especially if experienced over a number of years. Another possibility is that mood instability is actually a core or associated feature of depression and PTSD in some people but is not usually recognized as such.

Current evidence suggests that mood instability appears to be part of a cluster of symptoms which can be an early sign of illnesses such as Mania [35], depression [36] and Borderline Personality Disorder itself [37]. It may be that our finding of the importance of mood instability in explaining depression and PTSD represents a similar precursor, although a prospective design would be required to fully assess this.

Our second main finding is that mood instability in people with common mental disorders is clinically significant and important. Mood instability increased the risk of suicidal thinking over and above the risk attributed to a range of common mental disorders including depression and PTSD both of which are associated with suicidality [38,39]. The size of the effect of mood instability was comparatively large, both in the extent to which it explained the variance in suicidal thinking and being more important than the individual effect of depression , PTSD, OCD or GAD.

Previous evidence suggests that MI is important in explaining suicidality but it is not always clear, whether these effects are independent of the influence of mental illness. Thus in people with Bullimia Nervosa mood instability did not distinguish those with (N=29) and without (N=11) suicidal ideation [40] though overall there was a correlation between the disorder and the suicidal ideas. Similarly in a small sample of people at risk of developing psychosis, instability in negative emotions was associated with suicidal ideation also [41] though in this study the extent of psychotic symptoms as coded by the CAARMS was controlled for. Bowen et al [31] also report that in people who are depressed, mood instability correlates with suicidal thinking independent of the effect of neuroticism scores

Our findings therefore compliment and extend this body of emerging evidence by demonstrating that the effect of mood instability on suicidal thinking is independent of the influence of a range of diagnoses as well as socio-demographic factors in a representative and large sample of people. This research and that of others suggests that enquiring about mood instability should become much more important in the overall assessment of patients as well as in conducting risk assessments of suicidality.

The main limitation to the current analysis is that subjective reports of the severity or frequency of mood instability were not part of the standard assessment of the APMS. Mood instability was assessed through a global sentence without any data on duration or context such as stressful events being collected. Also the question that was used on the face of it focusses on mood variability, rather than intensity although some researchers believe both components are facets of instability [42,43]. However the definition of mood instability was tied to the assessment in the SCID-II which in turn is anchored to the DSM-IV. This was simple to understand and appropriate given its use in over 7000 people and consistent with other previous mood instability research [44]. A very similar mood instability question, as the one used in the current analysis has been utilised in other epidemiological research and responses found to predict future diagnosis of bipolar disorder [45]. One method increasingly advocated as a way to measure mood instability is ecological momentary assessment [3], but the demand that it places on respondents makes its use in household surveys a challenge.

In this study, participants aged 16 years onwards were included. Mood instability may be different in adolescents compared to adulthood. The question related to MI used the timeframe of the last several years, suicidal ideas over the last year and psychiatric symptoms over the last week. Therefore it is possible that the results might concern characteristics that did not occur at the same time, though the associations found between different factors were moderately large. We used a positive screen from the TSQ to indicate PTSD as opposed to a diagnosis of PTSD based on a structured clinical assessment. Previous analyses of the APMS 2007 suggest using the TSQ gives a PTSD prevalence of 3% and this is consistent with other general population prevalence rates using different PTSD measures [46].

In terms of the final model explaining suicidal thinking we did not enter impulsivity, aggressiveness and hopelessness as explanatory variables, though we did account for eleven other variables in the analysis. However future work should investigate the relationship between MI and these potentially important but overlapping constructs. Bipolar disorder is a condition commonly associated with mood instability and suicidal thoughts. We were not however able to enter bipolar disorder into our modelling as this information was not available from the APMS dataset.

Our results raise key questions for future research. We examined the association between mood instability and depression and PTSD as there was an existing literature, albeit limited, that we could draw upon to build and test a hypothesis. There is very limited previous research concerning mood instability in other mental illnesses and this clearly opens the way for further studies to explore this association and its consequences.

Given the nature of the APMS dataset we were not able to explore direction of causality and prospective data will be needed for this. Whilst mood instability if understood as a temperamental trait might be expected to be very persistent, evidence suggests that even over relatively short periods of time this may not be the case [47]. Therefore research using prospective data is also needed to address the question of how far mood instability persists over time, waxes and wanes and whether severity and longevity has any bearing on its association with mental illness, suicidality or other risk behaviours.

Finally, though we have identified that mood instability is strongly associated with depression and PTSD and has a more significant association with suicidal thinking than the common mental disorders, there is no clear treatment strategy for this problem. Whilst there

are potential pharmacological treatments, these and psychological treatments require further development and investigation.

Declaration of interest

We declare there are no conflicts of interest.

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Table 1 Changes in model deviance, likelihood ratio tests (LRT), p-values from X^2 tests and R^2 values after dropping of each term individually from logistic regression model explaining suicidal thinking

Model term	D.f.	Deviance	LRT	P-value	R^2
Full		1764.9			33.14
Age	6	1779.2	14.2	0.027	
Gender	1	1771.3	6.3	0.012	
Ethnic group	3	1776.1	11.1	0.011	
Employment status	2	1774.9	9.9	0.007	
Marital status	5	1780.9	16.0	0.007	
AUDIT score	2	1766.5	1.6	0.451	
Drug use	1	1784.5	19.6	<0.001	
PTSD	1	1791.0	26.1	<0.001	32.02
OCD	1	1800.5	35.6	<0.001	31.61
GAD	1	1794.6	29.7	<0.001	31.87
Depression	1	1800.1	35.2	<0.001	31.63
Mood Instability	1	1869.3	104.4	<0.001	28.64

Table 2 Associations of mood instability and mental illness with suicidal thinking in full logistic regression model

Model term	Odds ratio (95% confidence interval)
PTSD	3.03 (1.76- 5.25)
OCD	6.55 (2.74-15.63)
GAD	3.04 (1.88-4.92)
Depression	3.67 (2.15-6.26)
Mood Instability	4.82 (3.39-6.85)

Dependent variable: suicidal thoughts in the last year